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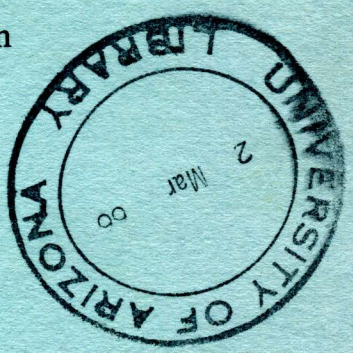

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Contents

ECONOMICS OF SKIP-ROW COTTON PRODUCTION

By Walter W. Pawson [1/] and Aaron G. Nelson [2/]

Summary and Conclusions

From 1962 to 1965, skip-row cotton production generally was very profitable. During that period, skip-row planting patterns in which less than four rows were skipped--such as "plant 2, skip 1"--were widely used. In 1961, Arizona farmers grew only 13 percent of the allotted acreage in skip-rows. By 1965, the percentage of cotton acreage represented by skip-row plantings had increased to 55 percent of the allotted acreage.

In 1966 and succeeding years, skip-row cotton production will be less profitable relative to alternative uses for the land than during the period 1962 to 1965. There are two basic reasons for this:

(1) The U. S. Department of Agriculture has announced new rules for measuring the acreage of cotton in skip-row fields in 1966. Henceforth, under the new rules, it will not pay a farmer to grow skip-row cotton in a planting pattern in which less than four rows are skipped, because the actual acreage of cotton must be drastically reduced if such a planting pattern is used. To maximize returns, if skip-row cotton is grown in 1966 and succeeding years, it will be necessary to use a planting pattern in which four or more rows are skipped, such as "plant 4, skip 4."

(2) Under the Food and Agriculture Act of 1965, applicable to the 1966 to 1969 cotton crops, much lower prices will prevail for upland cotton than in the past.

Generally speaking, it will not be profitable for most central Arizona farmers to cut down on the acreage of other crops to grow skip-row cotton.

Nevertheless, many farmers can maximize their profits by growing skip-row cotton. Under the 1966 Cotton Program, the idle, fallow land in skip-row cotton fields may be used to fill either the diverted acreage requirement or the conserving use requirement, provided four or more rows are skipped. It will generally be profitable for most farmers to incorporate their diverted acres within their cotton fields by using a "plant 8, skip 4" pattern or such other pattern or combination of planting patterns as will provide enough idle, skip-row fallow acreage to meet the requirement for diverted acres. Farmers who have idle or fallow land that cannot be planted to a commercial crop because of the need to maintain their normal conserving base acreage under the 1966

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Cotton Program can also profitably incorporate such land as a part of skip-row cotton fields.

On farms that produce very high yields of cotton--such as in Yuma or Mohave Counties--the production of skip-row cotton is likely to be more profitable relative to alternative uses for the land than it will be on most central Arizona farms.

Because Acala cotton responds better to skip-row planting than Deltapine and sells for a higher price, those who grow Acala varieties may find the production of skip-row cotton more profitable than alternative uses for the land.

Price supports on long-staple cotton will not be reduced in 1966. It will be just as profitable to grow long staple cotton in skip-row patterns such as "plant 4, skip 4" as it has been in recent years.

Purpose and Scope of This Report

The purpose of this report is to provide some guides to aid individual farmers in Arizona in reaching a decision on whether or not to grow skip-row cotton in 1966 and succeeding years.

The analyses are based on the best information and estimates available at this time concerning yields and costs of production for skip-row cotton relative to solid planted cotton on typical farms. Individual farmers should make appropriate adjustments in crop yields, commodity prices, and operating costs in applying the analyses to their own farms, because variations in these items may change the conclusions.

To provide a basis for the analyses, information on relative yields of solid planted and skip-row cotton is summarized first, followed by an analysis of costs of producing various patterns of skip-row cotton in relation to solid planted cotton. A summary of costs and returns from skip-row cotton during the 1962-65 period is presented to provide a base for comparison. The new ASCS rules applying to measurement of acreage in skip-row cotton fields in 1966 are discussed. An analysis of costs and returns with various skip-row patterns in 1966 is then presented, together with an analysis of adjustments which likely will be profitable.

Data concerning yields, costs, and returns per "acre" for skip-row cotton as presented in this report are for a planted acre of cotton--the land that is actually in cotton exclusive of the skipped rows--according to the customary interpretations that have prevailed for many years.

Relative Yields of Solid Planted and Skip-Row Cotton

Experiments have been conducted at the Cotton Research Center at Tempe and at the Branch Experiment Stations at Yuma and Marana concerning the relative yields of cotton obtained in various skip-row patterns in relation to the yield

of solid planted cotton. 3/ Field trials with skip-row plantings have been conducted on farms. 4/ The Department of Agricultural Economics of the University of Arizona also obtained information from 300 farmers in Maricopa and Pinal Counties in 1963 concerning the yields of cotton on their farms and the planting patterns that they used. 5/

Although the data from the experiments at the different locations and from other sources are not entirely consistent, the data from all sources were reviewed by a group of agricultural research and extension workers, and general conclusions were reached concerning yield relationships.

The higher yields that are produced per planted acre by skip-row plantings come from the outside rows. The wider the skip-row space, the greater is the yield increase. Where only one row is skipped, the yield of the outside rows with Deltapine and Pima varieties is estimated at 125 percent of solid planted cotton; where two rows are skipped, the outside rows yield about 135 percent as much as solid planted cotton; where four rows are skipped, the outside rows produce about 140 percent as much as a solid planting. Acala varieties give an estimated 8 percent greater relative yield increase from skip-row plantings than Deltapine and Pima varieties. On this basis, the relative yield per acre of typical planting patterns is estimated to be as follows:

Planting pattern	Skip-row as a percent of solid planted yield: Deltapine or Pima varieties	Skip-row as a percent of solid planted yield: Acala varieties
Solid planting	100	100
Plant 2, skip 1 . . .	125	135
Plant 2, skip 2 . . .	135	146
Plant 4, skip 1 . . .	112	121
Plant 4, skip 4 . . .	120	130
Plant 2, skip 4 . . .	140	151
Plant 8, skip 4 . . .	110	119

Cost of Producing Skip-Row Cotton in Relation to Solid Planted Cotton

There are two categories of production costs, "variable" costs and "fixed" costs.

"Variable" costs include such items as seed; fertilizer; insecticides;

3/ See "A Summary of Skip-Row Planted Cotton in Arizona," by R. E. Briggs and G. D. Massey, Cotton: A College of Agriculture Report, University of Arizona, Series P-1, pp. 19-21, February 1965.

4/ See "Skip-Row Cotton Favors Acala Varieties," by G. E. Blacklidge, Cotton: A College of Agriculture Report, University of Arizona, Series P-1, p. 21, February 1965.

5/ The farm survey was conducted under the direction of M. M. Kelso, William E. Martin and Robert A. Young, Agricultural Economists, Dept. of Agricultural Economics, University of Arizona.

chemical weed control materials; labor; fuel, oil, and repairs on farm machinery and equipment; custom work; irrigation district charges, or power, lubricants, and repairs on wells and pumps; and interest on production credit. The total amount spent on a given farm for these items varies with the acreage of the different kinds of crops that are grown and the production practices that are followed.

"Fixed" costs include such items as depreciation, interest, and insurance on farm machinery and equipment, buildings, and irrigation facilities; fixed land rentals or other land charges, including real estate taxes; and management. On a given farm, these costs do not change significantly, regardless of the particular combination of crops that are grown or the production practices that are used. Inasmuch as these costs remain fixed, they do not need to be and, in fact, should not be, considered in determining whether to grow solid planted or skip-row cotton, or whether to increase or decrease the acreage of other crops.

Table 1 shows the estimated variable costs of production per planted acre for solid planted cotton and several patterns of skip-row cotton on a typical farm in Maricopa or Pinal County.

It costs more per planted acre to grow skip-row cotton than solid planted cotton. However, not all items of cost for skip-row cotton increase in the same proportion, nor do the costs for the various planting patterns increase in the same proportion.

Seedbed preparation costs per acre of cotton increase in direct proportion to the amount of skip-row fallow in the field (table 1). For example, for "plant 2, skip 1" cotton, the seedbed preparation costs are 50 percent greater than for a solid planting.

Where four rows are skipped, it was assumed that weeds in the skips will be controlled by cultivation. This involves an extra cost. In "plant 2, skip 1" cotton, weeds in the skips are usually controlled by chemicals, at a cost for chemical weed control nearly double that for a solid planting (table 1). Where only two rows are planted, as in "plant 2, skip 1," or "plant 2, skip 4" patterns, it requires more time to plant or cultivate an acre of cotton because, with four or six-row equipment, the machinery covers not only the cotton rows but skip-row fallow as well. For these reasons, planting and cultivating costs are greater for skip-row cotton than for solid planted cotton (table 1).

More fertilizer is generally used on skip-row cotton than on solid planted cotton (table 1).

More irrigation water is used per planted acre for skip-row plantings than for solid plantings, although irrigation water use is not increased in proportion to the number of furrows.

In "plant 2, skip 1" fields, insecticides are generally applied by air to the entire acreage of the field, involving 50 percent greater costs for insecticides and insecticide application. However, where four rows are skipped, excessively high costs for insect control may be involved if the entire field is sprayed with chemicals. It was assumed that when four rows are skipped, the insecticides will be applied only on the cotton, and not on the skip-rows.

Table 1. Upland cotton: Estimated variable costs per planted acre for solid planted cotton and various patterns of skip-row cotton on a typical farm in Maricopa or Pinal County, Arizona 1/

Item	Variable costs per planted acre				Costs for skip-row planting as percentage of costs for solid planting		
	Solid planting	Skip-row planting					
		Plant 4, skip 4	Plant 2, skip 4	Plant 2, skip 1	Plant 4, skip 4	Plant 2, skip 4	Plant 2, skip 1
	Dols.	Dols.	Dols.	Dols.	Pct.	Pct.	Pct.
Seed	3.30	3.30	3.30	3.30	100	100	100
Seedbed preparation 2/	8.52	17.04	25.56	12.78	200	300	150
Planting & cultivating 3,4/	9.91	13.91	23.75	14.86	140	240	150
Fertilizer	21.23	23.35	25.48	24.41	110	120	115
Irrigation water	31.50	36.22	39.38	37.80	115	125	120
Irrigation labor	10.50	12.08	13.12	12.60	115	125	120
Insect & disease control 5/	26.50	30.00	30.00	39.75	113	113	150
Chemical weed control 4/	4.90	5.64	5.64	9.31	115	115	190
Hand thinning & weeding	9.45	9.45	9.45	9.45	100	100	100
Hail insurance	1.50	1.80	1.80	1.80	120	120	120
Defoliation	4.50	5.62	5.62	6.75	125	125	150
Harvesting & hauling 6/	28.97	29.54	30.10	29.66	102	104	102
Ginning	46.12	55.34	64.57	57.65	120	140	125
Supervision of labor	4.99	6.39	8.28	6.29	128	166	126
Production credit	4.51	5.29	6.01	5.67	117	133	126
Miscellaneous expenses 7/	7.68	9.01	9.60	9.14	117	125	119
Total variable costs 8/	224.08	263.98	301.66	281.22	118	135	125

1/ The figures for solid planting were adapted from the report, Costs and Returns for Major Field Crops in Central Arizona by Size of Farm, by Aaron G. Nelson, Ariz. Agr. Expt. Sta. Technical Bulletin in process of publication.

2/ Includes cutting stalks, disking, broadcasting fertilizer, subsoiling once every 4 or 5 years, plowing, disking, and floating or landplanting.

3/ Includes furrowing out, mulching, planting, dragging off, cultivating, side-dressing, and preparing ends of rows for irrigation.

4/ It is assumed that chemicals are used to control weeds in "plant 2, skip 1" cotton, but that when four rows are skipped, weeds will be controlled by cultivation of the skips.

5/ It is assumed that when four or more rows are skipped, the insecticides or other materials will be applied only on the cotton, and not on the skip-rows. On a "plant 2, skip 1" pattern, the entire field is assumed to be covered with materials.

6/ Machine harvesting costs are assumed not to vary with planting patterns and yields; hauling costs vary directly in proportion to the yield.

7/ Miscellaneous expenses include variable costs for use of auto and pickup, exclusive of hauling cotton; maintenance of head ditches and farm roads; irrigation siphons; small tools; and contributions to support the Cotton Producers' Institute, the Arizona Cotton Growers' Assn., and the National Cotton Council.

8/ Represents variable costs only; does not include fixed costs such as depreciation on farm machinery and equipment, buildings, and irrigation facilities; land rentals or other land charges, including real estate taxes; and management.

This may involve higher costs per acre for insecticide application than on a solid planting, but not more materials (table 1). Ground rigs are better adapted to spraying cotton where four rows are skipped than they are for spraying solid planted or "2 x 1" cotton. Some custom operators are offering to spray "plant 4, skip 4" cotton with ground rigs at the same rate per acre of cotton as solid plantings.

These same considerations apply to the application of chemical weed control materials and defoliants to skip-row cotton (table 1).

The cost of harvesting and hauling, for a farmer who has his own equipment, is practically the same regardless of the planting pattern that is used. About all the difference is that more trips must be made to the gin because of the higher yield of skip-row cotton.

All in all, the relative costs for growing solid planted or skip-row cotton on a typical farm in Maricopa or Pinal County are estimated to be as follows:

Planting pattern	Variable costs per planted acre	Extra variable costs per planted acre for skip-row planting	Costs for skip-row planting as percent of costs for solid planting
Solid planting	$224	----	----
Plant 4, skip 4 . . .	$264	$40	118 %
Plant 2, skip 4 . . .	$302	$78	135 %
Plant 2, skip 1 . . .	$281	$57	125 %

Skip-Row Cotton Was Highly Profitable During the Period 1962 to 1965

The estimated costs and returns per planted acre for solid planted cotton and various patterns of skip-row cotton on a typical farm in Maricopa or Pinal County during the years 1962-64 are shown in Table 2. This table shows that "plant 2, skip 1" cotton was highly profitable during this period. Compared to solid planted cotton yielding 2.25 bales per acre, "plant 2, skip 1" cotton is estimated to have produced 2.8 bales per acre--0.55 bale per acre more than solid planted cotton. Based on the average 1962-64 price of 30 cents per pound for cotton, this type of skip-row planting is estimated to have returned $93 more gross income per acre than solid planted cotton, while it cost $57 per acre more to grow the crop. Thus, the "plant 2, skip 1" pattern is estimated to have returned $36 more above variable costs for each acre of cotton than a solid planting. The "plant 2, skip 1" pattern requires 1 1/2 acres of land for each planted acre of cotton. Hence, the $36 additional income above variable costs that was produced by this extra 1/2 acre of land amounts to $72 per acre for the land utilized for skip-row fallow (table 2). This is a higher income per acre over variable costs than most farmers in this area receive from the production of alternative field crops such as alfalfa hay, barley, grain sorghum, or barley and grain sorghum double-cropped. This favorable return for "plant 2, skip 1" cotton explains why Arizona farmers increased skip-row cotton

Table 2. Upland cotton: Estimated costs and returns per acre for solid planted cotton and selected patterns of skip-row cotton on a typical farm in Maricopa or Pinal County, Arizona, based on 1962-1964 cotton programs and prices

Item	Unit	Solid planting 1/	Skip-row planting	
			Plant 4, skip 4	Plant 2, skip 1
Yield per acre				
Cotton	Bale	2.25	2.7	2.8
Cottonseed	Lb.	1740	2090	2175
Costs and returns per acre of cotton				
Gross income:				
Cotton (@ 30¢ per lb.)	Dol.	337.50	405.00	420.00
Cottonseed (@ $48.25 per ton)	Dol.	41.98	50.42	52.47
Total gross income	Dol.	379.48	455.42	472.47
Variable costs (table 1)	Dol.	224.08	263.98	281.22
Income over variable costs	Dol.	155.40	191.44	191.25
Additional income over variable costs from skip-row cotton:				
Per acre of cotton	Dol.	----	36.04	35.85
Per acre of skip-row fallow	Dol.	----	36.04	71.70

1/ The figures for solid planted cotton were adapted from the report, Costs and Returns for Major Field Crops in Central Arizona by Size of Farm, by Aaron G. Nelson, Ariz. Agr. Exp. Sta. Technical Bulletin in process of publication.

acreage from 13 percent of the total allotted acres of upland cotton in 1961 to 55 percent in 1965.

It will be further noted that under the 1962-64 programs and prices, a "plant 2, skip 1" planting made much more profitable use of the acreage devoted to skip-row fallow than skip-row patterns in which four rows were skipped. Table 2 shows that a "plant 4, skip 4" planting, for example, returned only $36 per acre of skip-row fallow, compared to $72 per acre for the fallow in "plant 2, skip 1" cotton fields.

In 1966 and Succeeding Years Low Prices Will Prevail for Upland Cotton and Farm Income Will Be Supported By Government Payments

For many years, U. S. market prices for cotton have been supported at a level substantially above world prices. Exports have been maintained by means of substantial export subsidies. Under the Food and Agriculture Act of 1965, applicable to the 1966 to 1969 cotton crops, the equalization payments on export cotton that have been necessary to maintain the prices of cotton to U. S. farmers above world market prices will be eliminated. Beginning with

the 1966 crop, U. S. market prices will be based on world market prices. The loan rates for the 1966-69 cotton crops will be dropped below anticipated world price levels. The Government loan rates for the 1966 crop will be 8 cents per pound less than for the 1965 crop. However, it is unlikely than market prices for the 1966 cotton crop will fall by quite as much as the 8-cent drop in loan rates. The following are the approximate prices that Arizona farmers might reasonably expect to receive for various varieties of cotton in 1966, according to estimates by The University of Arizona: 6/

Variety	Expected range of prices	Price assumed for this report 7/
Deltapine, Stoneville	20 - 22¢	21¢
Acala 4-42, A-44, Hopicala . .	22 1/2 - 24 1/2¢	23 1/2¢
Acala 1517	25 - 27¢	26¢

The returns from upland cotton production will be bolstered by Government price support and diversion payments to growers who reduce their cotton acreage below their effective acreage allotment. Growers who participate in this program in 1966 will receive a price-support payment of 9.42 cents per pound on the projected yield of the farm's domestic acreage allotment, which is 65 percent of the total cotton allotment. To participate in the program, a farmer must divert at least 12.5 percent of his cotton acreage allotment to conserving uses; he may divert 25 percent or 35 percent of his allotment to conserving uses. On the acreage that he diverts from cotton production to conserving uses in 1966, he will receive a diversion payment of 10.5 cents per pound on his projected yield of cotton as determined by the U. S. Department of Agriculture. The acreage that is diverted from cotton production to conserving uses must be in addition to the normal conserving base acreage for the farm. A Maricopa or Pinal County farmer who elects to divert 35 percent of his cotton acreage allotment to conserving uses will receive Government price support and diversion payments amounting to about $165 for each acre of cotton that he plants.

The check that a farmer will receive from the Government for price support payments and diversion payments under the new cotton program in 1966 will not be any different, whether the farmer grows solid planted cotton or skip-row cotton.

It is believed that most Arizona farmers will likely find that their most profitable alternative is to participate in the program to the extent of reducing their cotton acreage 35 percent below their effective allotment. For the analyses in this report, this is assumed to be the case.

The income per acre from skip-row cotton in relation to solid planted cotton will not differ regardless of whether a farmer elects to divert 12.5 percent, 25 percent, or 35 percent of his acreage allotment to conserving uses. This assumes that a farmer has adequate land and water resources to grow skip-row

6/ See Robert S. Firch, "Cotton Price Prospects for 1966," Cotton: A College of Agriculture Report, University of Arizona Series P-2, February 1966.

7/ Represents mid-point of the range of expected prices.

cotton whether he plants 65 percent, 75 percent, or 87.5 percent of his allotment to cotton. However, if land and water resources are limited, a farmer will be in a less favorable position to grow skip-row cotton if he elects to reduce his cotton acreage by only 12.5 percent or 25 percent than if he reduces his cotton acreage by 35 percent.

In 1966, New ASCS Rules Will Apply to Measurement of Acreage When Less Than Four Rows Are Skipped

For the 1966 crop, new rules for measuring skip-row cotton fields have been announced by the Agricultural Stabilization and Conservation Service (ASCS). The rule for determining the acreage of cotton in fields where four or more rows are skipped will remain the same as it has been for many years. However, if a planting pattern is used in which less than four rows are skipped, a larger percentage of the acreage of the field will be counted as cotton under the allotment program than in the years 1962 to 1965. Where less than four rows are skipped, the outside rows next to the idle land will be counted as using 30 percent more acreage than the inside rows or rows of solid planted cotton. The following examples illustrate, for various skip-row patterns, the percentage of the acreage in cotton fields that will be counted as cotton under the new rules, in contrast to the old rules:

Skip-row pattern	Percent of field charged as cotton under old rules	Percent of field charged as cotton under new rules	Percent decrease in permitted acreage of skip-row cotton fields under new rules
Plant 2, skip 1	66-2/3	86-2/3	23
Plant 2, skip 2	50	65	23
Plant 3, skip 1	75	90	16-2/3
Plant 4, skip 1	80	92	13
Plant 4, skip 2	66-2/3	76-2/3	13
Plant 4, skip 4	50	50	0
Plant 2, skip 4	33-1/3	33-1/3	0
Plant 8, skip 4	66-2/3	66-2/3	0

The new rules, in effect, reduce the permitted acreage of cotton if a planting pattern is used in which less than four rows are skipped.

Where less than four rows are skipped, the idle land between the rows of cotton which is not regarded as planted to cotton may not be used to fill the diverted acreage requirement. However, it may be counted as conserving use land in meeting the soil-conserving base requirement.

Where four or more rows are skipped, the idle land not counted as planted to cotton may be used to fill either the diverted acreage requirement or the conserving use requirement.

Skip-Row Cotton Will Be Less Profitable Under The 1966 Cotton Program Than Under Previous Programs

The new cotton program for 1966 will make a big difference in the relative profitability of skip-row and solid planted cotton.

Table 3 shows how this will apply to a typical farm in Maricopa or Pinal County. The estimated returns under the new cotton program for 1966 assume a price of 21 cents per pound for Deltapine cotton. Income from the sale of cotton and cottonseed will be augmented by large price support and diversion payments.

Table 3. Upland cotton: Estimated costs and returns per acre for solid planted cotton and selected patterns of skip-row cotton on a typical farm in Maricopa or Pinal County, Arizona, based on the 1966 Cotton Program and prices

Item	Unit	Solid planting	Skip-row planting		
			Plant 4, skip 4	Plant 2, skip 4	Plant 2, skip 1
Yield per acre					
Cotton	Bale	2.25	2.7	3.15	2.8
Cottonseed	Lb.	1740	2090	2440	2175
Costs & returns per acre of cotton 1/:					
Gross income:					
Cotton (@ 21¢ per pound)	Dol.	236.25	283.50	330.75	294.00
Cottonseed (@ $50 per ton)	Dol.	43.50	52.25	61.00	54.38
Price support payment 2/	Dol.	103.15	103.15	103.15	103.15
Diversion payment 3/	Dol.	61.91	61.91	61.91	61.91
Total gross income	Dol.	444.81	500.81	556.81	513.44
Variable costs (table 1)	Dol.	224.08	263.98	301.66	281.22
Income over variable costs	Dol.	220.73	236.83	255.15	232.22
Additional income over variable costs from skip-row cotton:					
Per acre of cotton	Dol.	----	16.10	34.42	11.49
Per acre of skip-row fallow	Dol.	----	16.10	17.21	22.98

1/ The costs and returns per acre for 1966 as shown here are for "an acre of cotton" as defined by ASCS under the old rules.

2/ The price support payment is based on the ASCS average projected yield for Maricopa and Pinal Counties of 1095 pounds per acre, at 9.42 cents per pound.

3/ The diversion payment is based on the ASCS average projected yield for Maricopa and Pinal Counties of 1095 pounds per acre, at 10.5 cents per pound, or $114.98 per acre diverted. Assuming diversion of 35 percent of the effective allotment, the diversion payment per acre of cotton planted would be 35/65 of this, or $61.91.

Under the 1966 program it will not pay a farmer to skip less than four rows. Assume, for example, that a farmer who has an effective allotment of 100 acres elects to divert 35 percent of his allotment to conserving uses and to plant his

domestic allotment of 65 acres to cotton. If he grows solid planted cotton, he will have 65 acres of cotton. If he uses a "plant 2, skip 1" pattern, the total acreage of the cotton field (cotton plus skip-row fallow) cannot exceed 75 acres because 86-2/3 percent, or 65 acres, will be counted as "cotton" under the allotment program. By the old standards, a 75-acre field of "plant 2, skip 1" cotton contains only 50 acres of actual cotton. Based on the estimated costs and returns as shown in table 3, the 50 acres of actual cotton in this field would return $232.22 per planted acre over variable costs, or a total of $11,611. This is 19 percent less than the estimated total income over variable costs that would be produced by a 65-acre field of solid planted cotton (65 acres @ $220.73 per acre = $14,368). This shows clearly that in 1966 it will not be profitable to plant cotton in skip-row patterns such as 2 x 1, 2 x 2, or 4 x 1, where less than four rows are skipped. This is because the actual acreage of cotton must be drastically reduced if these planting patterns are used.

Let us, therefore, consider skipping four rows. This would involve patterns such as "plant 4, skip 4;" "plant 2, skip 4;" "plant 8, skip 4;" etc.

Take a 4 x 4 planting, for example. It is estimated that this planting pattern will outyield a solid planting of Deltapine by about 20 percent, producing 2.7 bales per acre in Maricopa and Pinal Counties compared to a yield of 2.25 bales per acre for solid planted cotton. Based on a price of 21 cents per pound for Deltapine, the extra 225-pound yield of cotton and the extra 350 pounds of cottonseed would be worth about $56 (table 3). After deducting the estimated $40 of extra production costs per acre from the extra $56 per acre gross income, it is estimated that in 1966 a farmer would receive about $16 per acre more income above variable costs for a 4 x 4 planting than for a solid planting (table 3).

A "plant 2, skip 4" pattern would produce very high yields, It is estimated that on a typical farm in Maricopa or Pinal County, "plant 2, skip 4" cotton would yield 3.15 bales per acre compared to 2.25 bales for solid planted cotton. The 40 percent increase in yield would bring in $112 more gross income per planted acre. Variable costs of production for "plant 2, skip 4" cotton are estimated to be 35 percent--or $78 per planted acre--more than the cost of growing solid planted cotton. Thus, "plant 2, skip 4" cotton is estimated to produce $34 per planted acre more over variable costs than an acre of solid planted cotton (table 3). To achieve this, two acres of skip-row fallow would be utilized for each acre of cotton. Hence, the $34 additional income over variable costs per acre of cotton would be equivalent to an income over variable costs of $17 per acre for the additional land that is required to grow skip-row cotton, that is, for the land that is utilized as skip-row fallow (table 3).

A "plant 8, skip 4" pattern would involve yields, costs and returns per planted acre approximately half-way between those of a "plant 4, skip 4" pattern and solid planted cotton. Yields, costs and returns for a "plant 8, skip 4" pattern are estimated to be as follows, compared to solid planted cotton:

Item	Solid planted cotton	Plant 8, skip 4, cotton
Yield per acre (bales)	2.25	2.5
Gross income per planted acre	$444.81	$472.81
Variable costs per planted acre	224.08	244.03
Income over variable costs per planted acre	$220.73	$228.78
Additional income over variable costs from skip-row cotton:		
Per acre of cotton	----	$8.05
Per acre of skip-row fallow	----	$16.10

Thus, on a typical farm in Maricopa or Pinal County--regardless of whether a 4 x 4, 2 x 4, or 8 x 4 pattern is used--the income over variable costs for the extra land (skip-row fallow land) that would be used to grow skip-row cotton instead of solid planted cotton is estimated at $16 or $17 per acre.

Two questions are involved in determining whether or not it would pay to grow skip-row cotton:

(1) How do the prospective returns per acre from alternative crops compare with the returns from the extra land that would be needed to grow skip-row cotton?

(2) Is it necessary to reduce the acreage of other crops in order to grow skip-row cotton?

Comparison of Returns From Alternative Crops With Extra Returns From Skip-Row Cotton

On a typical farm in Maricopa or Pinal County, barley yielding 3,300 pounds per acre is estimated to gross $78 per acre; variable costs are estimated at $56 per acre, leaving $22 per acre income over variable costs (table 4). Early planted grain sorghum is estimated to return $20 per acre over variable costs; double cropped barley-grain sorghum, $33 per acre; and alfalfa hay, $24 to $48 per acre, depending upon the adequacy of water supply (table 4).

The estimated income over variable costs of $16 to $17 per acre for the extra land that is required to grow skip-row cotton in 1966 does not appear to be adequate to warrant reducing the acreage of alternative crops in order to grow skip-row cotton. With the level of yields, prices and costs used, skip-row fallow would not make as profitable use of land as would the production of alternative field crops.

Table 4. Estimated costs and returns per acre for alternative crops in Maricopa and Pinal Counties, Arizona 1/

Item	Barley	Grain sorghum, early planting	Barley-grain sorghum, double cropped			Alfalfa hay	
			Barley	Grain sorghum, late planting	Total	With ample water	With limited water
	Lbs.	Lbs.	Lbs.	Lbs.		Tons	Tons
Yield	3300	4100	3300	3400		6.5	4.25
	Dols/ cwt.	Dols/ cwt.	Dols/ cwt.	Dols/ cwt.		Dols/ ton	Dols/ ton
Price	2.35	2.05	2.35	2.05		25.00	25.00
	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Gross income	77.55	84.05	77.55	69.70	147.25	2/ 170.00	3/ 112.75
Variable costs							
Establish alfalfa stand	---	---	---	---	---	4/ 13.76	4/ 13.76
Seed	4.30	2.10	4.30	2.10	6.40	4/	4/
Seedbed preparation, planting & cultivating	5.55	11.71	5.55	8.16	13.71	5/ 4/	5/ 4/
Fertilizer	9.97	10.47	9.97	10.47	20.44	3.06	1.83
Irrigation water 6/	15.75	17.32	15.75	17.32	33.07	37.80	26.77
Irrigation labor	5.26	5.78	5.26	5.78	11.04	12.62	8.93
Harvesting and hauling	9.30	10.10	9.30	8.00	17.30	46.37	31.52
Supervision of labor	1.46	2.13	1.46	1.86	3.32	3.85	2.78
Production credit	1.16	1.52	1.16	1.23	2.39	.82	.63
Miscellaneous expenses	3.05	3.18	3.05	3.18	6.23	3.56	2.99
Total variable costs	55.80	64.31	55.80	58.10	113.90	121.84	89.21
Income over variable costs	21.75	19.74	21.75	11.60	33.35	48.16	23.54

1/ These data are based on the report, Costs and Returns for Major Field Crops in Central Arizona by Size of Farm, by Aaron G. Nelson, Arizona Agr. Expt. Sta., Technical Bulletin in process of publication.

2/ Includes $7.50 per acre income from rental of winter pasture.

3/ Includes $6.50 per acre income from rental of winter pasture.

4/ The cost of seed, seedbed preparation, and other costs of establishing the stand are included under the item, "establish alfalfa stand." One-third of the total variable costs for establishing the stand are charged annually, on the basis of a 3-year life of the stand.

5/ Includes cost of applying fertilizer.

6/ Based on estimated average per acre-foot cost of $6.30 for irrigation water.

Making Profitable Use of Idle Diverted Acres and Idle Conserving Base Acreage For Skip-Row Cotton Fields

Under the 1966 Cotton Program, the idle or fallow land in skip-row cotton

fields may be used to fill either the diverted acreage requirement or the normal conserving base acreage requirement, provided four or more rows are skipped. Production of skip-row cotton may offer an opportunity to profitably utilize diverted acreage. Such a planting pattern may also be used profitably where idle normal conserving acreage is available.

Take, for instance, a hypothetical example of a farmer with a 300-acre pump irrigated farm who has left his normal conserving acreage idle in previous years due either to the cost of water or an inadequate water supply. Let us assume that this farmer has a 100-acre cotton allotment of which he elects to plant 65 acres and to divert 35 acres to conserving uses. Let us assume also that he grows 100 acres of feed grains, and that he has a 100-acre normal conserving base acreage which, as assumed above, is idle or fallow land. It is estimated that this farmer could increase his total income over variable costs by about $2,200 by using his diverted acreage and conserving base acreage to grow "plant 2, skip 4" cotton instead of solid planted cotton (table 5).

Table 5. Estimated effect of cotton planting patterns on total income over variable costs from 100-acre cotton allotment on a hypothetical farm having a conserving base of 100 acres of idle or fallow land

Item	Unit	Grow solid planted cotton	Grow plant 4, skip 4 cotton	Grow plant 2, skip 4 cotton
Acreage:				
Cotton fields	Ac.	(65)	(130)	(195)
Cotton	Ac.	65	65	65
Diverted acres:				
Fields of idle or fallow land	Ac.	35	0	0
Fallow in skip-row cotton fields	Ac.	0	35	35
Total	Ac.	35	35	35
Conserving base acreage:				
Fields of idle or fallow land	Ac.	100	70	5
Fallow in skip-row cotton fields	Ac.	0	30	95
Total	Ac.	100	100	100
Feed grains	Ac.	100	100	100
Grand total	Ac.	300	300	300
Income over variable costs per planted acre of cotton (table 3)	Dol.	220.73	236.83	255.15
Total income over variable costs for 65-acres of cotton	Dol.	14,347	15,394	16,585
Added income over variable costs compared to solid planted cotton	Dol.	----	1,047	2,238

Let us examine another hypothetical case, that of a farmer in an irrigation district where there is a good water supply and very little idle land. Let us assume that this farmer, too, has a 100-acre cotton allotment, of which he will plant 65 acres and divert 35 acres to conserving uses; that he grows 100 acres of feed grains; and that his normal conserving base acreage consists of 100 acres of alfalfa hay. This farmer cannot plant all of his cotton in a 4 x 4 or 2 x 4 pattern without reducing either his acreage of alfalfa hay or feed grains. If he does so, he will sacrifice more potential income by cutting the acreage of these alternative crops than he will gain by growing skip-row cotton instead of solid planted cotton (according to the estimates of costs and returns as given in tables 3 and 4). Suppose, however, that instead of growing 65 acres of solid planted cotton, he grows 30 acres of solid planted cotton and 35 acres of "plant 4, skip 4" cotton. Or, as an alternative, he might grow 47 1/2 acres of solid planted cotton and 17 1/2 acres of "plant 2, skip 4" cotton. Or, if he grew all of his cotton in a "plant 8, skip 4" pattern, the acreage of skip-row fallow in his cotton fields would virtually meet the requirement for land that must be set aside as "diverted acres." It is estimated that by following any of these planting patterns he would add about $500 or $600 to his total income over variable costs for a 100-acre cotton allotment (table 6). In this case--based on the yields, costs, and returns per acre for skip-row cotton as estimated herein--it would be profitable to use such skip-row planting patterns as would provide just enough skip-row fallow to meet the requirement for "diverted acres," even though it would not be profitable for the farmer to cut down on the acreage of other crops in order to grow all of his cotton in skip rows.

Selecting a Skip-Row Planting Pattern

If skip-row cotton is grown in 1966, it will obviously be necessary to select a planting pattern in which four or more rows are skipped. A farmer's decision as to what particular skip-row pattern to use--4 x 4, 2 x 4, 8 x 4, or some other pattern--will depend in large part on how much land he has that can be utilized for skip-row cotton without reducing the acreage of alternative crops that would produce a higher income than skip-row fallow.

So long as a skip-row pattern is used in which four rows are skipped, it does not appear to make much difference what particular skip-row pattern is used so far as the income over variable costs per acre of skip-row fallow is concerned. The inside rows are like solid planted cotton. The additional yield comes from the outside rows. The extra costs that are entailed for skip-row cotton accrue largely from the cultural operations that must be performed on the skip-row fallow and from the extra plant nutrients and water that are utilized by the outside rows. The fewer inside rows there are, however, the more nearly can irrigation, fertilization, and other cultural practices be adapted to the needs of the outside rows from which larger yields are obtained. The "plant 2, skip 4" pattern would have an advantage in this respect.

High Yields in Yuma County More Conducive to Skip-Row Planting Than in Central Arizona

In Yuma County, solid planted cotton is estimated to yield 2.8 bales per acre compared to 2.25 bales in Maricopa or Pinal County. Thus, a 20 percent

Table 6. Estimated effect of cotton planting patterns on total income over variable costs from 100-acre cotton allotment on a hypothetical farm having no conserving base of idle or fallow land

Item	Unit	Grow solid planted cotton	Grow plant 8, skip 4 cotton	Grow some plant 4, skip 4 cotton	Grow some plant 2, skip 4 cotton
Acreage:					
Cotton fields	Ac.	(65)	(97-1/2)	(100)	(100)
Cotton:					
In solid planted fields	Ac.	65	0	30	47-1/2
In "plant 8, skip 4" fields	Ac.	0	65	0	0
In "plant 4, skip 4" fields	Ac.	0	0	35	0
In "plant 2, skip 4" fields	Ac.	0	0	0	17-1/2
Total	Ac.	65	65	65	65
Diverted acres:					
Fields of idle or fallow land	Ac.	35	2-1/2	0	0
Fallow in skip-row cotton fields	Ac.	0	32-1/2	35	35
Total	Ac.	35	35	35	35
Conserving base acreage:					
Alfalfa hay	Ac.	100	100	100	100
Feed grains	Ac.	100	100	100	100
Grand total	Ac.	300	300	300	300
Income over variable costs per planted acre of cotton (table 3):					
Solid planted cotton	Dol.	220.73	----	220.73	220.73
Plant 8, skip 4 cotton	Dol.	----	228.78	----	----
Plant 4, skip 4 cotton	Dol.	----	----	236.83	----
Plant 2, skip 4 cotton	Dol.	----	----	----	255.15
Average	Dol.	220.73	228.78	229.40	230.00
Total income over variable costs for 65 acres of cotton	Dol.	14,348	14,871	14,911	14,950
Added income over variable costs compared to solid planted cotton	Dol.	----	523	563	602

increase in yields resulting from a 4 x 4 planting in Yuma County represents more pounds of cotton and therefore a greater differential in gross returns from skip-row cotton than in central Arizona. It is estimated that in Yuma County, "plant 4, skip 4" cotton will produce $28 per acre more income over variable costs than will solid planted cotton (table 7). This compares to an estimated return of $16 per acre in Maricopa or Pinal County (table 7).

Table 7. Upland cotton: Estimated costs and returns per acre for solid planted and "plant 4, skip 4" cotton as related to varieties of cotton and locations in Arizona, 1966

Item	Unit	Deltapine				Acala 1517, Cochise County	
		Maricopa or Pinal County		Yuma or Mohave County			
		Solid planting	Plant 4, skip 4	Solid planting	Plant 4, skip 4	Solid planting	Plant 4, skip 4
Yield per acre:							
Lint	Bale	2.25	2.7	2.8	3.35	1.6	2.05
Cottonseed	Lb.	1740	2090	2170	2600	1340	1740
Price of products:							
Cotton - per pound	Cent	21	21	21	21	26	26
Cottonseed - per ton	Dol.	50	50	48	48	49	49
Gross income per acre:							
Cotton marketed	Dol.	236.25	283.50	294.00	351.75	208.00	266.50
Cottonseed marketed	Dol.	43.50	52.25	52.08	62.40	32.83	42.63
Price support payment	Dol.	103.15	103.15	127.36	127.36	79.79	79.79
Diversion payment	Dol.	61.91	61.91	76.44	76.44	47.89	47.89
Total	Dol.	444.81	500.81	549.88	617.95	368.51	436.81
Variable costs per acre:							
Seed	Dol.	3.30	3.30	3.30	3.30	3.30	3.30
Seedbed preparation	Dol.	8.52	17.04	8.52	17.04	9.12	18.24
Planting & cultivating	Dol.	9.91	13.91	9.91	13.91	9.91	13.91
Fertilizer	Dol.	21.23	23.35	32.00	36.80	16.89	18.58
Irrigation water	Dol.	31.50	36.22	11.50	13.22	20.94	24.08
Irrigation labor	Dol.	10.50	12.08	12.60	14.49	7.52	8.65
Insect & disease control	Dol.	26.50	30.00	13.25	14.97	14.75	16.67
Chemical weed control	Dol.	4.90	5.64	1.35	1.55	1.60	1.84
Hand thinning & weeding	Dol.	9.45	9.45	13.50	13.50	17.50	17.50
Hail insurance	Dol.	1.50	1.80	---	---	8.25	9.49
Defoliation	Dol.	4.50	5.62	4.50	5.62	4.50	5.62
Harvesting & hauling	Dol.	28.97	29.54	29.66	30.35	36.60	37.16
Ginning	Dol.	46.12	55.34	57.40	68.88	34.40	44.72
Supervision of labor	Dol.	4.99	6.39	5.41	6.87	4.24	5.57
Production credit	Dol.	4.51	5.29	4.00	4.67	4.21	4.91
Miscellaneous expenses	Dol.	7.68	9.01	8.39	9.86	6.83	8.16
Total variable costs	Dol.	224.08	263.98	215.29	255.03	200.56	238.40
Income per acre over variable costs	Dol.	220.73	236.83	334.59	362.92	167.95	198.41
Additional income over variable costs from skip-row cotton:							
Per acre of cotton	Dol.	----	16.10	----	28.33	----	30.46
Per acre of skip-row fallow	Dol.	----	16.10	----	28.33	----	30.46

Acala Cotton Responds Better to Skip-Row Planting Than Deltapine

It is estimated that "plant 4, skip 4" Acala cotton will yield 30 percent more than a solid planting, whereas Deltapine will yield only 20 percent more. Acala cotton also sells for a higher price per pound. For these reasons, there is a wider spread in the relative income from skip-row cotton and solid planted cotton in the case of Acala cotton than in the case of Deltapine. This is illustrated by estimates in table 7 pertaining to Acala 1517 cotton in Cochise County. According to these estimates, a 4 x 4 planting of Acala cotton would produce $30 more per planted acre over variable costs than a solid planting.

Planting Long Staple Cotton in Skip Rows

Price supports on long staple cotton in 1966 will be the same as they were on the 1964 and 1965 crops. However, under the new ASCS rules for measuring the acreage of cotton in skip-row fields, it will no longer be practical for farmers to grow long staple cotton in skip-row patterns in which less than four rows are skipped. The returns from "plant 4, skip 4" cotton in relation to solid planted cotton will be the same as in the last 2 years. As shown in table 8, the estimated additional returns from a skip-row planting of long staple cotton in Pima County are greater than in Maricopa or Pinal County. This is because long staple cotton produces higher yields in Pima County than in the other counties.

An Individual Decision

A farmer who is considering growing skip-row cotton will find it helpful to use his own judgment in adapting the figures that are presented in this report to fit his own situation as an aid in reaching a decision on whether or not to grow skip-row cotton in 1966 and succeeding years.

Table 8. Long staple cotton: Estimated costs and returns for solid planted and "plant 4, skip 4" cotton in selected counties in Arizona, 1966

Item	Unit	Maricopa and Pinal Counties		Pima and Santa Cruz Counties	
		Solid planting	Plant 4, skip 4	Solid planting	Plant 4, skip 4
Yield per acre:					
Lint	Bale	1.17	1.40	1.40	1.68
Cottonseed	Lb.	1060	1275	1275	1530
Price of products:					
Cotton - per pound	Cent	48	48	48	48
Cottonseed - per ton	Dol.	50	50	49	49
Gross income per acre:					
Cotton marketed	Dol.	268.80	321.60	321.60	385.92
Cottonseed marketed	Dol.	26.50	31.88	31.24	37.48
Total	Dol.	295.30	353.48	352.84	423.40
Variable costs per acre:					
Seed	Dol.	3.30	3.30	3.30	3.30
Seedbed preparation	Dol.	8.52	17.04	8.52	17.04
Planting and cultivating	Dol.	9.91	13.91	9.91	13.91
Fertilizer	Dol.	15.94	17.53	15.63	17.19
Irrigation water	Dol.	31.50	36.22	33.66	38.71
Irrigation labor	Dol.	10.50	12.08	9.62	11.06
Insect and disease control	Dol.	20.00	22.60	14.00	15.82
Chemical weed control	Dol.	4.90	5.64	5.05	5.81
Hand thinning and weeding	Dol.	9.45	9.45	9.45	9.45
Hail insurance	Dol.	1.50	1.80	2.50	3.00
Defoliation	Dol.	4.50	5.62	4.50	5.62
Harvesting and hauling	Dol.	29.08	29.66	30.01	30.78
Ginning	Dol.	41.77	50.12	49.98	59.98
Supervision of labor	Dol.	4.91	6.28	4.77	6.11
Production credit	Dol.	4.19	4.90	4.17	4.88
Miscellaneous expenses	Dol.	8.61	10.12	9.37	11.04
Total variable costs	Dol.	208.58	246.27	214.44	253.70
Income per acre over variable costs	Dol.	86.72	107.21	138.40	169.70
Additional income over variable costs from skip-row cotton:					
Per acre of cotton	Dol.	---	20.49	----	31.30
Per acre of skip-row fallow	Dol.	---	20.49	----	31.30